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IN THE U.S. PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of	Appeal No.
Robert GREINER et al.	Conf. 3850
Application No. 10/582,215	Group 1783
Filed June 8, 2006	Examiner P. Khatri

METAL/PLASTIC HYBRID AND SHAPED BODY PRODUCED THEREFROM

APPEAL BRIEF

MAY IT PLEASE YOUR HONORS:

(i) Real Party in Interest

The real party in interest in this appeal is the assignee, SIEMENS AKTIENGESELLSCHAFT of Munich, Germany.

(ii) Related Appeals and Interferences

None.

(iii) Status of Claims

Claims 9, 12, 16, 17, 19, 21 and 22 are pending, from whose final rejection this appeal is taken.

Claims 1-8, 10, 11, 13-15, 18 and 20 were cancelled.

(iv) Status of Amendments

The claims were amended in the Amendment After Final

Rejection filed July 19, 2010, responsive to the final Official Action of April 19, 2010 ("Final Action"). The Amendment was entered for the purpose of appeal pursuant to the Advisory Action of August 3, 2010 ("Advisory Action"). These claims are set forth in the Claims Appendix.

(v) **Summary of the Claimed Subject Matter**

In general terms, the claimed subject matter relates to a metal/plastic hybrid, i.e., independent claims 9 and 22, and a shaped body produced therefrom described in claim 16.

Independent claim 9 describes a metal/plastic hybrid which comprises:

a thermoplastic in a proportion of 10% to 25% by weight,

(Specification page 7-10. The percentages are disclosed at page 7, which includes 20%, 15%, 10% as a thermoplastic, i.e., polyamide 6 or PA6, in Embodiments 1.1, 1.2, and 1.3, respectively, and page 9, line 31, which includes 25% for the thermoplastic acrylonitrile butadiene styrene (ABS).)

a metal compound melting in the range between 100°C and 400°C the metal compound consisting essentially of a metal

selected from the group consisting of bismuth, zinc, tin and mixtures thereof, and

(Specification page 3, lines 31-33 and page 4, lines 21-22.)

an electrically conducting and/or metallic filler in the form of a copper fiber in a proportion of at least 30% by weight to 70% by weight, and is present jointly with the metal compound melting in the range between 100°C and 400°C in the hybrid as a fiber network, wherein,

(Specification page 4, lines 36-37; page 5, lines 2-3 and 21-24.)

a total proportion of (i) the metal compound melting in the range between 100°C and 400°C and (ii) the copper fiber is ≥ 60 % by weight, and

(Specification page 5, lines 9-11.)

the length of the copper fibers lies between 1 and 10 mm, the thickness is < 100 µm.

(Specification page 3, lines 9-11.)

In dependent claim 16 is a shaped body, produced by a plastic shaping process, and which is at least in part manufactured from a metal/plastic hybrid comprising a thermoplastic in a proportion of 10% to 25% by weight,

(Specification pages 7-10. The percentages are disclosed at page 7, which includes 20%, 15%, 10% as a thermoplastic, i.e., polyamide 6 or PA6, in Embodiments 1.1, 1.2, and 1.3, respectively, and page 9, line 31, which includes 25% for the thermoplastic acrylonitrile butadiene styrene (ABS).)

a metal compound melting in the range between 100°C and 400°C, the metal compound consisting essentially of a metal selected from the group consisting of bismuth, zinc, tin and mixtures thereof,

(Specification page 3, lines 31-33 and page 4, lines 21-22.)

and an electrically conducting and/or metallic filler in the form of a copper fiber in a proportion of at least 30% by weight to 70% by weight,

(Specification page 4, lines 36-37; page 5, lines 2-3 and 21.)

wherein a total proportion of (i) the metal compound melting in the range between 100°C and 400°C and (ii) the copper fiber is ≥ 60 % by weight.

(Specification page 5, lines 9-11.)

Independent claim 19 is directed to a metal/plastic hybrid, comprising:

a thermoplastic in a proportion of 10% to 25% by weight;

(Specification pages 7-10. The percentages are disclosed at page 7, which includes 20%, 15%, 10% as a thermoplastic, i.e., polyamide 6 or PA6, in Embodiments 1.1, 1.2, and 1.3, respectively, and page 9, line 31, which includes 25% for the thermoplastic acrylonitrile butadiene styrene (ABS).)

a lead-free metal compound melting in the range between 100°C and 400°C, the lead-free metal compound consists essentially of a metal; and

(Specification page 3, lines 31-33 and page 4, lines 17-19.)

an electrically conducting and/or metallic filler in the form of a copper fiber in a proportion between 30% by weight and 70% by weight, wherein,

the copper fiber is fused with the lead-free metal compound to provide a fiber network, and

(Specification page 4, lines 36-37; page 5, lines 2-3 and 21-28.)

a total proportion of (i) the metal compound melting in the range between 100°C and 400°C and (ii)the copper fiber is ≥ 60 % by weight.

(Specification page 5, lines 9-11.)

(vi) Grounds of Rejection to be Reviewed on Appeal

a. Whether claim 14 was properly rejected under 35 U.S.C. § 112, second graph, as being indefinite.

b. Whether claims 9, 12, 16-17, 19 and 21-22 were properly rejected under 35 U.S.C. §103(a) as being unpatentable over MATSUMOTO et al. US 20030153223 ("MATSUMOTO") in view of NAKAZAWA JP 09-241420 ("NAKAZAWA").

c. Whether claim 14 was properly rejected under 35 U.S.C. §103(a) as being unpatentable over MATSUMOTO in view of NAKAZAWA, further in view of KOSUGA et al. US 4,960,642 ("KOSUGA").

(vii) <u>Arguments</u>

<u>a. Claim 14 is not indefinite</u>.

Claim 14 was rejected in the Final Action for reciting a "particle" size, whereas the independent claim 9 recited fibers, not particles.

Claim 14 was cancelled in the amendment filed July 19, 2010, which was to be entered upon appeal according to the Advisory Action.

Thus, the rejection of claim 14 is rendered moot.

Although the size of claim 14 has been added to claim 9, it correctly refers to <u>fibers</u>. Thus, claim 9 is not indefinite.

<u>b. Claims 9, 12, 16-17, 19 and 21-22 are not unpatentable over MATSUMOTO in view of NAKAZAWA</u>.

The claims are separately argued according to the subheadings below.

Claims 9 and 12

The Examiner acknowledged the amendment to claim 9 in the Advisory Action, but maintained the rejections set for the reasons consistent with the Final Action. KOSUGA was offered for teaching the size previously recited claim 14, which has

presently in claim 9. Thus, KOSUGA will also be discussed relative to claim 9.

The metal/plastic hybrid of claim 9 comprises:

(1) 10 to 25% by weight of a thermoplastic, and

(2) ≥ 60 % by weight of a fiber network formed by copper fibers (length: between 1 and 10 mm and thickness < 100 µm) which are present jointly with a metal compound melting in the range between 100°C and 400°C (bismuth, zinc, tin and mixtures thereof). The copper fibers are at least 30 to 70% by weight of the hybrid.

MATSUMOTO was offered in Final Action for teaching a plastic electrical conductive material including a conductive material, such as copper fiber, a low melting alloy and a thermoplastic matrix. In the third paragraph of the Advisory Action on page 2, the Examiner stated that MATSUMOTO teaches tin combining with a metal filler to form a three-dimensional metal network structure (e.g., in paragraphs [0056] to [0060] of MATSUMOTO. The conclusion made was:

> As such, Examiner takes the position that any low-melting point material would intrinsically form a three-dimensional metal net structure and therefore meet the instant limitation of "fiber network".

However, MATSUMOTO does not disclose fibers present jointly with a metal compound to form a fiber network.

Indeed, While MATSUMOTO may suggest a metal net structure formed by the filling material of either powder or fiber, MATSUMOTO, taken as a whole, appears to teach away from

using fibers. Fibers are used in the comparative examples and "fibers may generate anisotropy when the electrically conductive material is formed by injection molding (paragraph [0023]).

MATSUMOTO does not teach:

- copper fibers forming a fiber network,
- a filler "greater than or equal to 60%" of the composition,
- the copper fibers themselves being between 30% and 70% of the composition, and
- copper fibers of any given length or thickness.

Compositionally, at best, MATSUMOTO discloses:

> **[0061]** The type of filler to be dispersed in the matrix resin is not limited, as long as the filler possesses electrical conductivity. For example, metal, carbon black having electrical conductivity may be used. It is preferable that the filler be in the form of a powder or fiber, particularly a metal powder. The metal powder for the filler can include high melting point metal such as copper, although it may be more preferable to include a low melting point metal alloy, such as an Sn—Cu system alloy, or Sn—Pb system alloy. From an environmental standpoint, the Sn—Cu system alloy may be more preferable. It is also possible to use a low melting point metal alone as the metal powder filler.

The only mention of copper fibers is in the comparative examples.

NAKAZAWA was offered for teaching a resin, 1-50% copper, and a low melting point compound alloy. The Examiner also noted that NAKAZAWA (in paragraph 8 of the English translation) discloses the combination of the low melting point

metal in combination with copper fibers has longer lasting conductivity as well as being environmentally friendly.

The conclusion in the Final Action was:

> Given that Matsumoto et al. disclose controlling the rate of mixture between the filler and matrix material affects the volume resistance and Nakazawa discloses the combination of the low melting point metal in combination with copper fibers has longer lasting conductivity as well as being environmentally friendly, it would have been obvious to one of ordinary skill in the art to use the low melting point compound of Nakazawa as the low melting point alloy of Matsumoto and to adjust the resin content to the desired filler in order to obtain the desired conductivity and resistivity profiles.

However, the <u>desired</u> features described by NAKAZAWA are <u>not</u> attributed to the mere combination of a low melting point metal and copper fibers. The abstract states:

> PROBLEM TO BE SOLVED: To obtain a composition, composition. comprising a thermoplastic resin, an electroconductive fiber and a specific low-melting metal in a specific proportion, capable of retaining electromagnetic wave shielding effects, excellent in long-term characteristics and environmental compatibility without eluting lead and useful as housings, etc., of various electronic devices.
> SOLUTION: This leadless electroconductive resin composition comprises (A) 30-98wt.% thermoplastic resin such as a polyphenylene ethereal resin, a polystyrene-based resin, an acrylonitrile-butadienestyrene resin, a polycarbonate resin or a blended material thereof, (B) 1-50wt.% electroconductive fiber such as a metallic fiber (e.g a copper fiber, a brass fiber, a stainless steel fiber, an aluminum fiber or a nickel fiber) and (C) 0.1-30wt.% low-melting metal without containing lead (e.g. an In-Sn alloy, an In-Bi alloy or an Sn-Ag alloy) and, as necessary, further (D) a flux in an amount of 0.1-10 pts.wt. based on 100 pts.wt. component C.

That is, NAKAZAWA attributes the desired features to the leadless electroconductive resin composition as a whole, including <u>30-98%</u> thermoplastic resin. Thus, to even approach the claimed invention, which includes 10-25% thermoplastic, would have been contrary to the requirements of NAKAZAWA, and there would not have been a reasonable expectation of success.

Even if one were to modify MATSUMOTO as proposed by the Examiner, the combination of MATSUMOTO and NAKAZAWA does not teach copper fibers being present "jointly" with the low melting point metal compound to provide a fiber network, as well the specific dimensions of the fibers.

KOSUGA was offered for teaching the copper fiber dimensions, as applied to the previously pending claim 14, and presently recited in claim 9.

KOSUGA (col. 2, lines 25-33) uses conductive fiber in the form of a bundle of 1,000 to 10,000 fibers. Each fiber has a thickness of 8 to 50μm. This bundle is coated with a thermoplastic resin such that the resin fills the interstices of the conductive fibers to enable the fibers to be uniformly dispersed with the resin (col. 2, lines 63-68 and column 3, lines 6-12). The amount of the resin is between 5 and 30% (col. 3, lines 42-49).

It is this uniform dispersion that is formed into pellets of 3 to 10 mm in length (col.4, lines 3-21), but there is no description of the length of the fibers *per se*. Indeed, the Examples of the KOSUGA method solely refer to lengths of the pellets, whereas the comparative examples 7-12 describe specific fiber lengths.

Nevertheless, the Examiner concluded in the Final Action:

> Given that Matsumoto and Nakazawa disclose the use copper fibers and Kosuga et al. disclose the sizes of the conductive

> fibers needed for optimal shielding and conductivity, it would have been obvious to one of ordinary skill in the art to use the fibers of Kosuga in an amount as disclosed by Nakazawa within the composition of Matsumoto in combination with the low melting point alloy of Kosuga to yield the network structure as shown by Matsumoto and provide longer lasting conductivity.

The Examiner maintained in the Advisory Action (beginning at the sentence bridging pages 2 and 3):

> While it is noted that Kosuga discloses a pellet having a specific length, it is also noted that the length of said pellets effect [sic] the shielding properties. Given that it has been established that the dimensions of the fibers (i.e. the diameter) and further the resulting pellet effect [sic]the shielding properties, Examiner takes the position that the fibers must be within a range of 3 to 10 mm in order to exhibit the desired shielding and conductive properties.

However, to obtain the desired features of KOSUGA, one would have required a structure of a <u>bundle</u> of fibers dispersed with a resin, or uniformly dispersing the fibers within the resin.

The fibers in the <u>bundles</u> are <u>without</u> any other linking metal materials between the fibers, i.e., the fibers are <u>not</u> present “jointly” with the any metal compound to form the fiber network. Indeed, KOSUGA teaches that fibers present jointly with other fibers is a <u>negative</u> attribute of the prior art, i.e., “it is not yet possible to obtain a practical shield effect due to an increase in multiple contacts among conductive fibers and to the consequence increase of electrical resistance of the electromagnetic wave shielding material.” (column 1, lines 44-47).

Thus, KOSUGA teaches the use of copper fibers in manner <u>contrary</u> to the claimed invention, and at the very least, the

combination fails to teach copper fibers present "jointly" with the low melting metal compound to <u>form a fiber network</u>.

For these reasons, the claim 9 is not rendered obvious by the combination of MATSUMOTO, NAZAKAWA and KOSUGA.

Therefore, the rejection of independent claim 9, and dependent claim 12 should be reversed.

Claims 16 and 17

Independent claim 16 describes a shaped body, produced by a plastic shaping process, and which is at least in part manufactured from a metal/plastic hybrid.

This metal plastic hybrid comprises:

(1) 10% to 25% by weight of thermoplastic;

(2) a metal compound melting in the range between 100°C and 400°C, the metal compound consisting essentially of a metal selected from the group consisting of bismuth, zinc, tin and mixtures thereof;

(3) 30% to 70% by weight of copper fibers; and

(4) the amount of (2) and (3) is ≥ 60 % by weight.

As noted above with respect to independent claim 9, MATSUMOTO fails to teach or suggest the specific combination of fibers (of any metal) and a metal (or even a lead-free) compound melting in the range between 100°C and 400°C or greater than or equal to 60% by weight of this combination, with the fibers alone

being 30% and 70% of the composition. Indeed, MATSUMOTO clearly prefers powders.

NAKAZAWA, as also discussed above, is not simply limited to the use of metal fibers, such as copper fibers, in combination with a low melting metal. Instead, the success of the composition is attributed to the leadless electroconductive resin composition, as a whole, which includes 30-98% thermoplastic resin, i.e., outside of the claimed range.

Thus, the proposed combination of MATUMOTO and NAKAZAWA teaches 30-98% thermoplastic resin, which is outside of the claimed 10-25% thermoplastic range, and the combination does not render obvious claim 16.

Therefore the rejection of independent claim 16 and dependent claim 17 should be reversed.

Claims 19, 21 and 22

The metal/plastic hybrid of independent claim 19 includes:

(1) 10% to 25% by weight of thermoplastic;

(2) ≥ 60 % by weight of copper fiber is fused with a lead-free metal compound to provide a fiber network;

(3) the copper fiber between 30% and 70% by weight of the hybrid; and

(4) the lead-free metal compound melting in the range between 100°C and 400°C, the lead-free metal compound consists essentially of a metal.

As noted above with respect to independent claim 9, MATSUMOTO fails to teach or suggest the specific combination of fibers (of any metal) with the metal compound melting in the range between 100°C and 400°C to form a fiber network. MATSUMOTO also fails to suggest greater than or equal to 60% by weight of this combination, with the fibers alone being 30% and 70% of the composition. MATSUMOTO, as a whole, prefers powders over fibers, and MATSUMOTO does not disclose copper fibers useful.

NAKAZAWA, as also discussed above, is not simply limited to the use of metal fibers, such as copper fibers, in combination with a low melting metal. Instead, the success of the composition is attributed to the leadless electroconductive resin composition, as a whole, which includes <u>30-98%</u> thermoplastic resin. This is outside of the claimed 10-25% range.

NAKAZAWA teaches a variety of techniques to arrive at the leadless electroconductive resin composition in paragraph [0020] of the English translation. However, none of these techniques include or suggest that the metal fibers are to be <u>fused</u> with a lead-free metal to form a fiber network.

Thus, the proposed combination of MATUMOTO and NAKAZAWA fails teach copper fibers that are <u>fused</u> with a lead-free metal

to form a fiber network and 10-25% thermoplastic. Accordingly, the combination fails to render obvious independent claim 19.

Therefore, the rejection of independent claim 19 and dependent claims 20 and 21 should be reversed.

c. Claim 14 is not unpatentable over MATSUMOTO in view of NAKAZAWA, further in view of KOSUGA.

Claim 14 was cancelled in the amendment filed July 19, 2010, which was to be entered upon appeal according to the Advisory Action. Thus, the rejection of claim 14 is rendered moot.

However, the teachings of KOSUGA on which the Examiner relied to reject claim 14 are addressed above relative to claim 9, as claim 9 specifies the size of the fiber similar to claim 14.

Conclusion

From the foregoing discussion, it is believed to be apparent the rejections are improper and should be reversed. Such action is accordingly respectfully requested.

The Appeal Brief fee of $540.00 is being paid online concurrently herewith by credit card.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future submissions, to charge any underpayment or credit any overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

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Enclosures: Claims Appendix

(viii) <u>Claims Appendix</u>

9. A metal/plastic hybrid which comprises:

a thermoplastic in a proportion of 10% to 25% by weight,

a metal compound melting in the range between 100°C and 400°C the metal compound consisting essentially of a metal selected from the group consisting of bismuth, zinc, tin and mixtures thereof, and

an electrically conducting and/or metallic filler in the form of a copper fiber in a proportion of at least 30% by weight to 70% by weight, and is present jointly with the metal compound melting in the range between 100°C and 400°C in the hybrid as a fiber network, wherein,

a total proportion of (i) the metal compound melting in the range between 100°C and 400°C and (ii) the copper fiber is ≥ 60 % by weight, and

the length of the copper fibers lies between 1 and 10 mm, the thickness is < 100 µm.

12. The metal/plastic hybrid according to claim 9, which has a specific volume resistance of less than 10^{-2} Ωcm and/or a thermal conductivity of > 5W/mK.

16. A shaped body, produced by a plastic shaping process, and which is at least in part manufactured from a metal/plastic hybrid comprising a thermoplastic in a proportion of 10% to 25% by weight, a metal compound melting in the range between 100°C and 400°C, the metal compound consisting essentially of a metal selected from the group consisting of bismuth, zinc, tin and mixtures thereof, and an electrically conducting and/or metallic filler in the form of a copper fiber in a proportion of at least 30% by weight to 70% by weight, wherein a total proportion of (i) the metal compound melting in the range between 100°C and 400°C and (ii) the copper fiber is ≥ 60 % by weight.

17. The metal/plastic hybrid according to claim 16, which has a specific volume resistance of less than 10^{-2} Ωcm and/or a thermal conductivity of > 5W/mK.

19. A metal/plastic hybrid, comprising:

a thermoplastic in a proportion of 10% to 25% by weight;

a lead-free metal compound melting in the range between 100°C and 400°C, the lead-free metal compound consists essentially of a metal; and

an electrically conducting and/or metallic filler in the form of a copper fiber in a proportion between 30% by weight and 70% by weight, wherein,

the copper fiber is fused with the lead-free metal compound to provide a fiber network, and

a total proportion of (i) the metal compound melting in the range between 100°C and 400°C and (ii)the copper fiber is ≥ 60 % by weight.

21. The metal/plastic hybrid according to claim 19, wherein the metal of the lead-free metal compound is selected from the group consisting of bismuth, zinc, tin and combinations thereof.

22. The metal/plastic hybrid according to claim 19, which has a specific volume resistance of less than 10^{-2} Ωcm and/or a thermal conductivity of > 5W/mK.

(ix) <u>Evidence Appendix</u>

None.

(x) Related Proceedings Appendix

None.